Catalogue no. 82-003-X
ISSN 1209-1367

Health Reports

# Oral contraceptive use among women aged 15 to 49: Results from the Canadian Health Measures Survey

by Michelle Rotermann, Sheila Dunn and Amanda Black

Release date: October 21, 2015

Statistics Canada Statistique Canada

Canada

## How to obtain more information

For information about this product or the wide range of services and data available from Statistics Canada, visit our website, www.statcan.gc.ca.

You can also contact us by

**email at** infostats@canada.ca

**telephone,** from Monday to Friday, 8:30 a.m. to 4:30 p.m., at the following toll-free numbers:

- Statistical Information Service 1-800-263-1136
- National telecommunications device for the hearing impaired 1-800-363-7629
- Fax line 1-877-287-4369

**Depository Services Program**

- Inquiries line 1-800-635-7943
- Fax line 1-800-565-7757

## Standards of service to the public

Statistics Canada is committed to serving its clients in a prompt, reliable and courteous manner. To this end, Statistics Canada has developed standards of service that its employees observe. To obtain a copy of these service standards, please contact Statistics Canada toll-free at 1-800-263-1136. The service standards are also published on www.statcan.gc.ca under "Contact us" > "Standards of service to the public."

## Note of appreciation

Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued co-operation and goodwill.

## Standard table symbols

The following symbols are used in Statistics Canada publications:

. not available for any reference period
.. not available for a specific reference period
... not applicable
0 true zero or a value rounded to zero
$0^s$ value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
$^p$ preliminary
$^r$ revised
x suppressed to meet the confidentiality requirements of the *Statistics Act*
$^E$ use with caution
F too unreliable to be published
* significantly different from reference category ($p < 0.05$)

Published by authority of the Minister responsible for Statistics Canada

© Minister of Industry, 2015

All rights reserved. Use of this publication is governed by the Statistics Canada Open Licence Agreement.

**An** HTML version **is also available.**

*Cette publication est aussi disponible en français.*

# Oral contraceptive use among women aged 15 to 49: Results from the Canadian Health Measures Survey

*by Michelle Rotermann, Sheila Dunn and Amanda Black*

## Abstract

**Background:** Oral contraceptives (OCs) have been available in Canada for over 50 years and are the most commonly used method of reversible contraception. OCs have evolved over time, with decreasing estrogen doses, new progestins, and different dosing regimens. Detailed data about OC use among Canadian women are lacking.

**Methods:** Data from Statistics Canada's 2007/2009 and 2009/2011 Canadian Health Measures Survey (CHMS) were used to estimate OC use, by selected sociodemographic characteristics, cardiovascular risk factors, and estrogen dose and progestin type. Logistic regression was used to model relationships between OC use and sociodemographic factors.

**Results:** An estimated 1.3 million (16%) women aged 15 to 49 reported taking OCs in the previous month. OC use decreased with age (30% among 15- to 19-year-olds; 3% among 40- to 49-year-olds). OC users were significantly more likely than non-users to be nulliparous, sexually active and Canadian-born. At ages 35 to 49, users were less likely than non-users to have one or more cardiovascular risk factors. Almost all (99%) OC users took combined formulations containing ethinyl estradiol (EE) and progestin. Two-thirds of OCs users took formulations containing 30 or more mcg of EE. Women aged 15 to 24 were more likely than those aged 35 to 49 to use lower-dose formulations (less than 30 mcg of EE).

**Interpretation:** A substantial percentage of reproductive-aged Canadian women, particularly younger women, used OCs. OC use varied by sociodemographic and some cardiovascular risk factors. The majority took formulations containing 30 or more mcg of EE.

**Keywords:** Contraception, estrogen, pregnancy prevention, progestin, reproductive health

Oral contraceptives (OCs) have been available in Canada for more than 50 years and are the most commonly used method of reversible contraception.[1,2] They are also among the medications most frequently used by Canadian women,[3] an estimated three-quarters of whom take OCs at some point in their lives.[4] OCs include combined hormonal contraceptive pills, which contain both estrogen and a progestin, and progestin-only pill.

Although primarily indicated for pregnancy prevention, OCs have non-contraceptive benefits, including cycle regulation; less dysmenorrhea; fewer ovarian cysts; improved perimenopausal, vasomotor, moliminal and endometriosis symptoms; decreased menstrual flow, acne and hirsutism; and decreased risk of endometrial and ovarian cancer.[5-9]

For the vast majority of healthy, non-smoking women, OCs are safe.[1,4,8] However, like many medications, OCs can be associated with side effects and risks,[7,10-14] including cardiovascular events such as venous thromboembolism (VTE), myocardial infarction, and stroke. Prospective cohort studies have found that the risk of VTE is two times higher in OC users than in non-users (9 or 10/10,000 woman-years versus 4 or 5/10,000 woman-years).[15,16] Even so, the risk of VTE during pregnancy and the postpartum period is much higher than that associated with OC use.[17] OCs may also increase the risk of breast cancer,[12,18,19] although 10 years after use ceases, the risk returns to baseline.[18]

OCs have evolved over time, with decreasing estrogen doses, new progestins, and different dosing regimens. As the estrogen dose has decreased, the risk of cardiovascular events and certain cancers appears to have lessened.[12,20] The use of different progestins may confer different risk-benefit profiles.[9-10,13,21]

Despite widespread exposure of Canadian women to these medications, detailed information about OC use is lacking. Administrative dispensary or billing data contain very basic sociodemographic information and tend to be available only for certain provinces (for example, British Columbia[22,23]). Some national surveys have included OC-specific content, but are either dated[24] or pertain only to youth,[25] and none have captured information about OC formulations. For instance, the Canadian Contraception Survey lacked data on OC type and other health indicators.[2]

Based on results for 2007 to 2011 from the Canadian Health Measures Survey (CHMS), the present study estimates the prevalence of OC use among non-pregnant reproductive-aged women; profiles OC users by sociodemographic characteristics and cardiovascular risk factors; and identifies the OCs used, by estrogen dose and progestin type.

## Methods

The CHMS, which is conducted by Statistics Canada in partnership with the Public Health Agency of Canada (PHAC) and Health Canada, produces nationally representative estimates.[26] Data collection occurs in two steps: an interview at the respondent's home and a subsequent visit by the respondent to the CHMS mobile examination centre where physical measures

**Authors:** Michelle Rotermann (michelle.rotermann@statcan.gc.ca) is with the Health Analysis Division at Statistics Canada, Ottawa, Ontario. Sheila Dunn is with the Department of Family and Community Medicine at the University of Toronto, Toronto, Ontario. Amanda Black is with the Department of Obstetrics and Gynecology at the University of Ottawa, Ottawa, Ontario.

and blood and urine samples are taken. The CHMS excludes people living on reserves and other Aboriginal settlements in the provinces, full-time members of the Canadian Forces, the institutionalized population, and residents of some remote regions (less than 4% of the target population).[27] Ethics approval for the CHMS was obtained from Health Canada's Research Ethics Board.[28]

Of households selected for CHMS cycles 1 (2007 to 2009) or 2 (2009 to 2011), 72.7% agreed to participate, 89.3% of whom completed the household questionnaire. After adjustments for the sampling strategy, the final response rate for people age 6 to 79 for the two cycles combined was 53.5%.[27]

Cycle 1 took place from March 2007 through February 2009, and collected information from 5,604 respondents aged 6 to 79 living in private households in 15 locations across Canada. Cycle 2 took place from August 2009 through November 2011, and collected data from 6,395 respondents aged 3 to 79 living in private households in 18 locations. The combined sample for the two cycles was 11,999. Cycle 1 respondents were not eligible to participate in cycle 2. Nearly 95% (11,387/11,999) of cycle 1 and 2 respondents completed the mobile examination centre component. One record was dropped because all prescription medication-related fields were missing.

The present study combined data for 15- to 49-year-old women from each cycle for a total 2,790. The analysis excluded 85 respondents because of self-reported pregnancy (n = 66) or missing/unknown pregnancy status (n = 19), yielding a final sample of 2,705.

Drug identification numbers (DINs) were collected from the packaging of medications (maximum of 15) during the household interview and verified during the mobile examination centre visit. Only medications that respondents reported taking in the month before the household interview were used. A computer-assisted reference tool facilitated medication capture when required. Each DIN was associated with Anatomical Therapeutic Chemical (ATC) classification codes assigned by Health Canada.[29] In accordance with Statistics Canada's *Directive on Sensitive Information*, which includes the protection of brands, the specific medications identified based on the DINs are presented as aggregate ATC codes.[30]

The OCs used by study participants correspond to 13 level-7 ATC codes. *Oral contraceptive users* (Appendix A) were compared with non-users. Non-users were defined as women who did *not* report using OCs or other hormonal contraceptive formulations in the month before the household interview. Non-oral hormonal contraceptives included transdermal, intravaginal, and injectable contraceptives and correspond to three level-7 ATC codes (Appendix A). Identification and removal of users of these other hormonal contraceptive formulations helped ensure that the groups were as distinct as possible and were not taking similar hormones delivered non-orally.

For several reasons, use of hormonal IUDs was likely underestimated by CHMS respondents. Respondents may not have considered the device a medication, and it may have been inserted several years previously, thereby affecting recall. The small number of respondents (fewer than 5) who reported hormonal IUDs were considered "non-users" in the analysis, largely because the non-user group likely contained other respondents who did not report use of a similar device. Preliminary analyses suggested that excluding these cases altogether or including them in the non-user or other hormonal category did not substantively change the results.

Descriptive statistics were used to present OC use by age group, marital status, parity, immigrant status, household income, sexual activity, and having a regular doctor. Multiple logistic regression was used to model relationships between these variables and OC use. Selection of covariates was based on the literature and data availability.

Age groups were established according to the respondent's age at the time of the household interview. Marital status was categorized as married, living common-law, previously married (including separated, divorced and widowed), and single (never married). Parity (number of live births) was categorized as nulliparous (none) parous (one or more). Respondents were classified as being sexually active if they answered "yes" to the question: "In the past 12 months, have you had sexual intercourse?" Immigrant status was classified as immigrant or Canadian-born based on country of birth and citizenship. Household income, adjusted for household size, was classified into two categories: higher and lower. Households were classified as higher income if their past-year adjusted total earnings were in the highest income quartile (top 25% of households), and lower income if they were in the lower three quartiles. Respondents were asked if they had "a regular medical doctor."

Descriptive statistics were used to estimate OC use by cardiovascular risk factors overall and by age. Cardiovascular risk factors were: daily smoking, (BMI) based on measured height and weight, and a composite measure of "heart disease, stroke or hypertension."

Those aged 18 or older with a BMI of 25 or more were classified as overweight/obese; those whose BMI was 25 to 29.9 were classified as overweight; and those whose BMI was 30 or more were classified as obese. For 15- to 17-year-olds, the Centers for Disease Control BMI categorization was used. Adolescents of the same age and sex with height/weight corresponding to the 86$^{th}$ percentile or higher were classified as overweight/obese; those in the 86$^{th}$ to 95$^{th}$ percentile were classified as overweight; and those above the 95$^{th}$ percentile were classified as obese.

The composite measure of heart disease, stroke or hypertension was based on respondents' reporting that a health professional had diagnosed them with heart disease, heart attack, high blood pressure (BP) or stroke. Use of cardiovascular-related medications—anti-hypertensives, lipid-modifying agents (statins), thrombolytics (anti-coagulants) or anti-platelets—was also considered to indicate the presence of these conditions (Appendix B).

Respondents' BP was taken six times; those with an average systolic BP of 140 mmHg or more and/or an average diastolic BP of 90 mmHg or more were considered to have hypertension. The three cardiovascular risk factors (daily smoking, overweight/obesity, and the composite measure of heart disease, stroke and/or hypertension) were combined into a single dichotomous cardiovascular risk factor variable; respondents were categorized as having at least one risk factor or no risk factors. Data on other medical conditions that are contraindications for OC use, such as migraine headache with aura and personal history of breast cancer,[31] were either not available, or the sample with the condition was too small to analyze (fewer than 10).

OC use was categorized by the dose of ethinyl estradiol (EE) (less than 30 micrograms (mcg) or 30 or more mcg), and by progestin type (levonorgestrel, norgestimate, drosperinone, desogestrel or other). Information about active ingredients and EE dosages was taken from Health Canada's *Drug Product Database*.[32]

To account for survey design effects, coefficients of variation and 95% confidence intervals were estimated with the bootstrap technique.[33] Differences between prevalence estimates were calculated with t-tests. All analyses were conducted in SUDAAN v.11 (RTI International, Research Triangle Institute, NC, USA), using weighted data and DDF = 24 in the procedure statements to account for the degrees of freedom of the combined datasets. Details about the CHMS, including sampling, quality assurance and combining cycles, are available elsewhere.[26,27]

## Results

### Sociodemographic and behaviour characteristics

According to combined data from the 2007 to 2009 and 2009 to 2011 CHMS, 1.3 million (16%) non-pregnant women aged 15 to 49 used OCs in the previous month (Table 1). OC use decreased from 30% among 15- to 19-year-olds to 3%

**Table 1**
**Prevalence of oral contraceptive use, by selected characteristics, women aged 15 to 49, household population, Canada, 2007 to 2011**

| Characteristic | Number '000 | 95% confidence interval from | to | % | 95% confidence interval from | to |
|---|---|---|---|---|---|---|
| **Total** | **1,297.8** | **1,096.4** | **1,499.2** | **16.2** | **14.0** | **18.7** |
| **Age group** | | | | | | |
| 15 to 19† | 316.3 | 242.6 | 390.0 | 29.9 | 24.4 | 36.0 |
| 20 to 24 | 312.9‡ | 184.3 | 441.5 | 29.2 | 21.3 | 38.6 |
| 25 to 29 | 278.9‡ | 155.8 | 402.0 | 26.8‡ | 18.4 | 37.2 |
| 30 to 34 | 197.1‡ | 106.1 | 288.0 | 20.0‡* | 13.4 | 28.9 |
| 35 to 39 | 120.2‡ | 71.0 | 169.3 | 9.7‡* | 6.4 | 14.4 |
| 40 to 49 | 72.4‡ | 40.7 | 104.1 | 2.8‡* | 1.8 | 4.1 |
| **Marital status** | | | | | | |
| Married | 242.9‡ | 145.8 | 340.1 | 7.6‡* | 5.2 | 10.8 |
| Common-law | 303.8 | 198.0 | 409.7 | 22.5 | 17.5 | 28.4 |
| Previously married | 22.4‡ | 7.2 | 37.6 | 4.7‡* | 2.4 | 9.0 |
| Single† | 728.6 | 570.1 | 887.1 | 24.7 | 20.2 | 29.9 |
| **Parity (number of children)** | | | | | | |
| Nulliparous (none)† | 932.0 | 767.5 | 1,096.4 | 25.9* | 21.7 | 30.7 |
| Parous (one or more) | 365.1 | 261.1 | 469.1 | 8.4 | 6.5 | 10.9 |
| **Sexually active in past year** | | | | | | |
| No | 175.3‡ | 69.5 | 281.2 | 13.7‡ | 7.9 | 22.6 |
| Yes† | 1,121.8 | 950.7 | 1,292.8 | 16.9 | 14.7 | 19.4 |
| **Immigrant** | | | | | | |
| No† | 1,164.6 | 971.8 | 1,357.3 | 19.0 | 16.7 | 21.5 |
| Yes | 133.2‡ | 41.1 | 225.4 | 7.1‡* | 3.7 | 13.2 |
| **Household income** | | | | | | |
| Lower† | 653.2 | 485.9 | 820.5 | 17.0 | 13.1 | 21.6 |
| Higher | 644.6 | 519.9 | 769.3 | 15.5 | 13.0 | 18.4 |
| **Has regular medical doctor** | | | | | | |
| No | 150.0‡ | 73.8 | 226.1 | 13.7‡ | 8.9 | 20.6 |
| Yes† | 1,147.8 | 935.8 | 1,359.8 | 16.6 | 14.0 | 19.5 |

† reference category
* significantly different from reference category ($p < 0.05$)
‡ use with caution
**Source:** 2007 to 2009 and 2009 to 2011 Canadian Health Measures Survey, combined.

**Table 2**
**Adjusted odds ratios relating oral contraceptive use to selected characteristics, women aged 15 to 49, household population, Canada, 2007 to 2011**

| Characteristic | Adjusted odds ratio | 95% confidence interval from | to |
|---|---|---|---|
| **Age group** | | | |
| 15 to 19 | 14.49* | 7.14 | 29.38 |
| 20 to 24 | 10.93* | 5.10 | 23.45 |
| 25 to 29 | 8.65* | 3.59 | 20.85 |
| 30 to 34 | 8.03* | 3.57 | 18.03 |
| 35 to 39 | 3.75* | 1.73 | 8.09 |
| 40 to 49† | 1.00 | 1.00 | 1.00 |
| **Marital status** | | | |
| Married† | 1.00 | 1.00 | 1.00 |
| Common-law | 1.63 | 0.87 | 3.05 |
| Previously married | 0.74 | 0.33 | 1.69 |
| Single, never married | 1.35 | 0.68 | 2.70 |
| **Parity (number of children)** | | | |
| Nulliparous (none) | 2.09* | 1.27 | 3.42 |
| Parous (one or more)† | 1.00 | 1.00 | 1.00 |
| **Sexually active in past year** | | | |
| No† | 1.00 | 1.00 | 1.00 |
| Yes | 3.96* | 1.52 | 10.37 |
| **Immigrant** | | | |
| No | 2.66* | 1.21 | 5.84 |
| Yes† | 1.00 | 1.00 | 1.00 |
| **Household income** | | | |
| Lower† | 1.00 | 1.00 | 1.00 |
| Higher | 1.11 | 0.66 | 1.89 |
| **Has regular doctor** | | | |
| No | 0.56 | 0.28 | 1.10 |
| Yes† | 1.00 | 1.00 | 1.00 |

† reference category
* significantly different from reference category ($p < 0.05$)
**Note:** Excludes women using other hormonal contraceptives (transdermals, intravaginals, and injectables).
**Source:** 2007 to 2009 and 2009 to 2011 Canadian Health Measures Survey, combined.

among 40- to 49-year-olds. The average age of OC users was 26 years, compared with 35 years for non-users (data not shown). OC use was significantly higher among single compared with married/previously married women, among nulliparous compared with parous women, and among Canadian-born compared with immigrant women. Differences in the prevalence of OC use by sexual activity, household income, and having a regular medical doctor were not significant.

Because sociodemographic and behaviour characteristics are not independent of each other, multiple logistic regression analysis was performed to account for the simultaneous effects of these factors (Table 2). The adjusted odds of OC use were higher for women aged 15 to 39 than those aged 40 to 49. As well, the adjusted odds were significantly higher in women who were nulliparous, sexually active in the past year, or Canadian-born. Marital status, household income, and having a regular doctor were not significantly associated with OC use.

## Cardiovascular risk factors

All cardiovascular risk factors except smoking were less prevalent among OC users than among non-users aged 15 to 49. OC users were significantly less likely than non-users to be overweight (19% versus 25%), obese (15% versus 22%), or have heart disease, stroke and/or hypertension (5% versus 10%) (Table 3). Differences in smoking rates between the user and non-user groups were not significant. When these cardiovascular risk factors were combined into a single dichotomous measure, OC users were significantly less likely than non-users to have at least one (43% versus 58%).

At older ages, cardiovascular risk tends to increase, while OC use declines. To examine the prevalence of cardiovascular risk factors among OC users and non-users independent of age differences, results were stratified by age group (15 to 34 versus 35 to 49). In both age groups, the prevalence of each cardiovascular risk factor tended to be lower among OC users, but only one difference was statistically significant: at ages 35 to 49, non-users were more likely to have at least one cardiovascular risk factor (67% versus 48%).

## Oral contraceptive formulation

Almost all (99%) OC users took OCs containing a combination of ethinyl estradiol (EE) and a progestin (data not shown). More than half (56%) took OCs containing EE in combination with levonorgestrel or norgestimate (Table 4). Desogestrel- and drospirenone-containing formulations were taken by 17% and 16% of OC users, respectively.

During the study reference period, the combination OCs available in Canada contained 20 to 50 mcg of EE. Two-thirds

**Table 3**
**Prevalence of cardiovascular risk factors among oral contraceptive users and non-users, by age group, non-pregnant women aged 15 to 49, household population, Canada, 2007 to 2011**

| | Oral contraceptive | | | | | |
|---|---|---|---|---|---|---|
| | User | | | Non-user | | |
| | | 95% confidence interval | | | 95% confidence interval | |
| Risk factor | % | from | to | % | from | to |
| **Overweight** | | | | | | |
| 15 to 49 | 19.2[†] | 13.7 | 26.3 | 25.3 | 21.7 | 29.2 |
| 15 to 34 | 17.8[E] | 11.8 | 25.9 | 22.5 | 16.8 | 29.4 |
| 35 to 49 | 27.4[E] | 19.0 | 37.7 | 27.5 | 23.1 | 32.5 |
| **Obese** | | | | | | |
| 15 to 49 | 15.4[E†] | 9.9 | 23.1 | 22.1 | 19.1 | 25.3 |
| 15 to 34 | 15.3[E] | 9.3 | 24.1 | 18.5 | 15.0 | 22.7 |
| 35 to 49 | F | ... | ... | 24.9[†] | 21.1 | 29.1 |
| **Overweight or obese** | | | | | | |
| 15 to 49 | 34.6[†] | 27.1 | 42.9 | 47.5 | 42.6 | 52.4 |
| 15 to 34 | 33.1 | 24.9 | 42.4 | 41.1 | 34.3 | 48.2 |
| 35 to 49 | 43.3 | 29.7 | 58.0 | 52.6[†] | 46.9 | 58.3 |
| **Heart disease, stroke and/or hypertension** | | | | | | |
| 15 to 49 | 5.3[E†] | 2.9 | 9.6 | 9.9 | 8.1 | 12.1 |
| 15 to 34 | F | ... | ... | 3.1[E] | 1.9 | 5.0 |
| 35 to 49 | F | ... | ... | 15.4[†] | 12.1 | 19.4 |
| **Daily smoker** | | | | | | |
| 15 to 49 | 13.6[E] | 8.9 | 20.2 | 16.7 | 13.5 | 20.5 |
| 15 to 34 | 15.1[E] | 9.6 | 23.0 | 13.0 | 9.3 | 17.8 |
| 35 to 49 | F | ... | ... | 19.7[†] | 15.2 | 25.2 |
| **One or more risk factors[‡]** | | | | | | |
| 15 to 49 | 43.0[†] | 35.7 | 50.5 | 58.3 | 53.1 | 63.4 |
| 15 to 34 | 42.1 | 34.4 | 50.3 | 48.0 | 41.5 | 54.5 |
| 35 to 49 | 47.9[†] | 30.0 | 66.3 | 66.7[†] | 60.3 | 72.6 |

[†] significantly different from non-oral contraceptive users ($p < 0.05$)
[‡] significantly different from 15- to 34-year-olds ($p < 0.05$)
[§] Includes the 3 cardiovascular risk factors (daily smoking, overweight/obesity and the composite measure of heart disease, stroke and/or hypertension).
[E] use with caution
F too unreliable to be published
... not applicable
**Note:** Excludes women using other hormonal contraceptives (transdermals, intravaginals, and injectables).
**Source:** 2007 to 2009 and 2009 to 2011 Canadian Health Measures Survey, combined.

**Table 4**
**Percentage distribution of oral contraceptives used, by estrogen and progestin type, women aged 15 to 49, household, Canada, 2007 to 2011**

| | | 95% confidence interval | |
|---|---|---|---|
| Estrogen/Progestin type | % | from | to |
| Total | 100.0 | ... | ... |
| Ethinylestradiol/Levonorgestrel | 28.5 | 22.7 | 35.2 |
| Ethinylestradiol/Norgestimate | 27.2 | 22.7 | 32.1 |
| Ethinylestradiol/Desogestrel | 17.3[E] | 12.1 | 24.1 |
| Ethinylestradiol/Drospirenone | 16.1[E] | 9.9 | 25.3 |
| Other | 10.9[E] | 7.4 | 15.7 |

[E] use with caution
... not applicable
**Source:** 2007 to 2009 and 2009 to 2011 Canadian Health Measures Survey, combined.

**Table 5**
**Percentage of oral contraceptive users taking formulations containing 30 micrograms of estrogen or more, by age group, women aged 15 to 49, household population, Canada, 2007 to 2011**

| | | 95% confidence interval | |
|---|---|---|---|
| Age group | % | from | to |
| **15 to 49** | **66.1** | **59.8** | **72.0** |
| 15 to 24 | 60.3* | 48.5 | 71.0 |
| 25 to 34 | 68.5 | 57.6 | 77.7 |
| 35 to 49[1] | 79.4 | 67.4 | 87.8 |

[1] reference category
* significantly different from reference category ($p < 0.05$)
**Source:** 2007 to 2009 and 2009 to 2011 Canadian Health Measures Survey, combined.

of users (66%) took an OC containing 30 or more mcg of EE (Table 5), with most (99%) taking 30- or 35-mcg-EE formulations (data not shown). Women aged 15 to 24 were significantly less likely than those aged 35 to 49 to take OCs containing 30 or more mcg of EE: 60% versus 79%.

## Discussion

This is the first nationally representative analysis of OC use by sociodemographic characteristics, cardiovascular risk factors, and medication formulation.

Estimates of OC use in Canada (16% of women aged 15 to 49) were comparable to survey-based estimates for 2006 to 2010 from the United States (17% of women aged 15 to 44)[34] and a 1996/1997 Canadian estimate (18% of women aged 15 to 49).[24] It is difficult to compare CHMS data with those of studies from countries such as Denmark[35] and Australia,[4,36] which used non-specific annual or bi-annual reference periods and/or excluded some populations.

In this study, OC use decreased with age, and nulliparous women were more likely than parous women to use OCs. These findings are similar to other Canadian studies and to American, Danish, and Australian research.[2,4,24,34-36] Possible explanations may be that at older ages, women prefer IUDs, permanent contraceptive methods, or barrier methods. Health care providers may also be hesitant to prescribe OCs for women older than 40 because of the risk of adverse events or because older women are more likely to have medical conditions that are contraindications for OC use.[37]

Cultural factors may affect attitudes toward contraception and the use of hormones. According to CHMS results, Canadian-born women were more likely than immigrant women to use OCs. Other studies[34,38,39] have also found lower use of hormonal contraceptives by immigrant and/or minority women, who may prefer condoms, intrauterine devices, and permanent methods.[34,38,40] Preference for non-hormonal methods may also stem from concerns about weight gain and compromised future fertility, and a belief that OCs are unhealthy.[39,41]

Certain cardiovascular risk factors—uncontrolled hypertension, smoking after age 35, and heart disease—are contraindications for OC use.[37] Other cardiovascular risk factors, such as obesity, are not contraindications, but may be associated with an increased risk of adverse events. Although the CHMS data demonstrated a lower prevalence of cardiovascular risk factors among OC users than non-users, the former were considerably younger. It is not clear if the difference in cardiovascular risk can be attributed solely to the age gap between the groups, because the CHMS sample is not large enough to attain statistical significance for most calculations. As more CHMS cycles become available, sample sizes and statistical power will increase.

Potential side effects and adverse events associated with OCs may be influenced by estrogen dose and progestin type. For example, cancer risk or adverse cardiovascular events may be related to estrogen dose,[12,20,42] so reducing EE may lower rates of these adverse events. After 2010, OCs containing 50 mcg or more of EE ceased to be available in Canada[32]; currently, only OCs containing 35 mcg or less of EE are available. CHMS data covering the 2007-to-2011 period show that virtually all (99%) Canadian OC users were taking formulations with 35 mcg or less of EE: one third were using formulations with less than 30 mcg. Younger women, who presumably would be healthier and have fewer cardiovascular risk factors, were more likely than women aged 35 to 49 to be taking OCs with less than 30 mcg of EE. Similarly, other research showed that newer products, which tend to contain less EE, are more often taken by younger women[35]; older women, with potentially higher risk profiles, continue to take higher EE-dose formulations.

### *What is already known on this subject?*

- Oral contraceptives (OCs) are the most common method of reversible contraception.
- Over time, OCs have evolved, with decreasing estrogen doses, new progestins, and different dosing regimens.
- Despite widespread exposure of Canadian women to these medications, detailed information about OC use in Canada is lacking.

### *What does this study add?*

- An estimated 1.3 million (16%) women aged 15 to 49 reported using OCs in the previous month.
- OC use decreased sharply with age from 30% at ages 15 to 19 to 3% at ages 40 to 49.
- OC users were significantly more likely than non-users to be sexually active, Canadian-born and nulliparous.
- At ages 35 to 49, OC users were less likely than non-users to have one or more cardiovascular risk factors.
- Almost all (99%) OC users took combined formulations containing ethinyl estradiol (EE) and progestin.
- Women aged 15 to 24 were more likely than those aged 35 to 49 to use lower-dose formulations (less than 30 mcg of EE).

The impact of different progestins on risk and side effect profiles is controversial. Some experts consider levonorgestrel to be the safest,[10,11] with the lowest risk of OC-associated VTE. Others contend that no appreciable difference exists in VTE risk between any of the progestins.[15,16,43]

According to the CHMS data, the progestins most commonly taken were levonorgestrel and norgestimate. The CHMS findings by progestin type are comparable to administrative prescription data from British Columbia,[22] but are less consistent with prescribing patterns in other countries.[44]

## Limitations

The results of this analysis should be interpreted in the context of several limitations. The data are self-reported, and so are susceptible to recall bias. Logistical and budgetary constraints restricted the number of CHMS collection sites and sample sizes.[27] Consequently, this analysis occasionally used more general covariate categories than desirable. As well, the CHMS does not collect data on some relevant covariates, such as pregnancy intentions, recent pregnancy/birth, use of other contraceptive methods, duration of OC use, indications for OC use, breastfeeding, and insurance coverage. Small sample sizes may result in the analysis being underpowered to detect statistically significant differences. Although survey weights ensured that the sample is representative of the target population, bias may exist if the use of medications by respondents and non-respondents differed systematically.

## Conclusion

This analysis provides a basis for examining trends in the use of OCs by Canadian women. The results also allow for international comparisons. This is the first national, population-based study to provide detailed sociodemographic and cardiovascular risk information about Canadian OC users and the types of OCs they take. As additional CHMS data become available in the future, it will be possible to combine cycles for a more detailed and ongoing analysis of OC use in Canada. ■

# References

1. Fisher WA, Black A. Contraception in Canada: a review of method choices, characteristics, adherence and approaches to counselling. *Canadian Medical Association Journal* 2007; 176(7): 953-61.
2. Black A, Yang Q, Wen SW, et al. Contraceptive use among Canadian women of reproductive age: results of a national survey. *Journal of Obstetrics and Gynecology Canada* 2009; 31(7): 627-40.
3. Rotermann M, Sanmartin C, Hennessy D. Prescription medication use by Canadians aged 6 to 79. *Health Reports* 2014; 25(6): 3-9.
4. Yusuf F, Siedlecky S. Patterns of contraceptive use in Australia: an analysis of the 2001 National Health Survey. *Journal of Biosocial Science* 2007; 39: 735-44.
5. Reid RL. Non-contraceptive uses of hormonal contraceptives. *Obstetrics and Gynecology* 2010; 115(1): 206-18.
6. Collaborative Group on Epidemiological Studies of Ovarian Cancer. Ovarian cancer and oral contraceptives: collaborative reanalysis of data from 45 epidemiological studies including 23,257 women with ovarian cancer and 87,303 controls. *Lancet* 2008; 371: 303-14.
7. Charleton BM, Rich-Edwards JW, Colditz GA, et al. Oral contraceptive use and mortality after 36 years of follow-up in the Nurses' Health Study: Prospective cohort study. *British Medical Journal* 2014; 349. doi: 10.1136/bmj.g6356.
8. Hannaford PC, Iverson L, Macfarlane TV, et al. Mortality among contraceptive pill users: Cohort evidence from Royal College of General Practitioners' oral contraceptive study. *British Medical Journal* 2010; 340(c927). doi: 10.1136/bmj.c297.
9. Maxwell GL, Schildkraut JM, Calingaert B, et al. Progestin and estrogen potency of combination oral contraceptives and endometrial cancer risk. *Gynecologic Oncology* 2006; 103: 535-40.
10. Vinogradova Y, Coupland C, Hippisley-Cox J. Use of combined oral contraceptives and risk of venous thromboembolism: nested case-control studies using the QResearch and CPRD databases. *British Medical Journal* 2015; 350. doi:10.1136/bmj.h2135.
11. Lidegaard O, Hougaard L, Wessel C, et al. Risk of venous thromboembolism from use of oral contraceptives containing different progestogens and oestrogen doses: Danish cohort study. *British Medical Journal* 2011; 343. doi: 10.1136/bmj.d6423.
12. Beaber EF, Buist DSM, Barlow WE, et al. Recent oral contraceptive use by formulation and breast cancer risk among women aged 20 to 49 years of age. *Cancer Research* 2014; 74(15): 4078-89.
13. Food and Drug Administration, Office of Surveillance and Epidemiology. *Combined Hormonal Contraceptives (CHCs) and the Risk of Cardiovascular Disease Endpoints.* FDA 2011: http://fda.gov/downloads/Drugs/DrugSafety/UCM2777384.pdf
14. van Hylckama Vileg A, Helmerhorst FM, Vandenbroucke JP, et al. The venous thrombotic risk of oral contraceptives, effects of oestrogen dose and progestogen type: results of the MEGA case-control study. *British Medical Journal* 2009; 339:b2921. doi:10.1136/bmj.b2921
15. Dinger JC, Heinemann LAJ, Kuhl-Habich D. The safety of a drospirenone-containing oral contraceptive: final results from the European Active Surveillance Study on Oral Contraceptives based on 142,475 women-years of observation. *Contraception* 2007; 75: 344-54.
16. Dinger J, Bardenheuer K, Heinemann K. Cardiovascular and general safety of a 24-day regimen of drospirenone-containing combined oral contraceptives: final results from the International Active Surveillance Study of Women Taking Oral Contraceptives. *Contraception* 2014; 89(4): 253-63.
17. Heit JA, Kobbervig CE, James AH, et al. Trends in the incidence of venous thromboembolism during pregnancy or postpartum: A 30-year population-based study. *Annals of Internal Medicine* 2005; 43(10): 697-706.
18. Collaborative Group on Hormonal Factors in Breast Cancer. Breast cancer and hormonal contraceptives: collaborative reanalysis of individual data on 53,297 women with breast cancer and 100,239 women without breast cancer from 54 epidemiological studies. *Lancet* 1996; 347: 1713-27.

19. Kahlenborn C, Modugno F, Potter DM, et al. Oral contraceptive use as a risk factor for premenopausal breast cancer: A meta-analysis. *Mayo Clinic Proceedings* 2006; 81(10): 1290-1302.

20. Lewis MA. The transnational study on oral contraceptives and the health of young women. Methods, results, new analyses and the healthy user effect. *Human Reproduction Update* 1999; 5(6): 707-20.

21. Parkin L, Sharples K, Hernandez RK, et al. Rick of venous thromboembolism in users of oral contraceptives containing drospirenone or levonorgestrel: nested case-control study based on UK General Practice Research Database. *British Medical Journal* 2011; 340: d2139.

22. Morgan S, Cunningham C, Hanley G, et al. *The British Columbia Rx Atlas 2nd Edition.* Vancouver, British Columbia: UBC Centre for Health Services and Policy Research, 2009.

23. Morgan S, Smolina K, Mooney D, et al. *The Canadian Rx Atlas 3rd Edition.* Vancouver, British Columbia: UBC Centre for Health Services and Policy Research, 2013.

24. Wilkins K, Johansen H, Beaudet MP, et al. Oral contraceptive use. *Health Reports* 2000; 11(4): 25-37.

25. Statistics Canada. CCHS documentation. Available at: http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getInstanceList&SDDS=3226&InstaId=15282&SurvId=144171

26. Giroux S, Labrecque F, Quigley A. *Sampling Documentation for Cycle 2 of the Canadian Health Measures Survey.* Methodology Branch Working Paper 002. Ottawa: Statistics Canada, 2013.

27. Statistics Canada. CHMS documentation. Available at: http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getInstanceList&SDDS=5071&InstaId=25905&SurvId=145921

28. Day B, Langlois R, Tremblay M, Knoppers BM. Canadian Health Measures Survey: ethical, legal and social issues. *Health Reports* 2007; 18(Suppl): 37-51.

29. WHO Collaborating System for Drug Statistics Methodology. *Structure and Principles.* Available at: http://www.whocc. no/atc/structure_and_principles/

30. Statistics Canada. *Statistics Canada's Directive on the Security of Sensitive Statistical Information.* Available at: http://icn-rci.statcan.ca/31/31b/pdf/31b_009-eng.pdf

31. Black A, Francoeur D, Rowe T. Canadian contraception consensus. *Journal of Obstetrics and Gynecology* 2004; 143: 219-54.

32. Health Canada. *Drug Product Database Online Query Tool.* Available at: http://webprod5.hc-sc.gc.ca/dpd-bdpp/start-debuter.do?lang=eng

33. Rust KF, Rao JNK. Variance estimation for complex surveys using replication techniques. *Statistical Methods in Medical Research* 1996; 5: 281-310.

34. Jones J, Mosher W, Daniels K. Current contraceptive use in the United States, 2006-2010,and changes in patterns of use since 1995. *National Health Statistics Reports* 2012; 60. Available at: http://www.cdc.gov/nchs/data/nhsr/nhsr060.pdf

35. Wilson NM, Laursen M, Lidegaard Ø. Oral contraception in Denmark 1998-2010. *Acta Obstetricia et Gynedologica Sccandinavica* 2012. doi: 10.111/j.1600-0412.2012.01416.x.

36. Lucke JC, Watson M, Herbert D. Changing patterns of contraceptive use in Australian women. *Contraception* 2009; 80: 533-9.

37. Centres for Disease Control. U.S. *Medical Eligibility Criteria for Contraceptive Use, 2010: Adapted from the World Health Organization Medical Eligibility Criteria for Contraceptive Use, 4th edition.* Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5904a1.htm?s_cid=rr5904a1_e

38. Saxena S, Copas AJ, Mercer C, et al. Ethnic variations in sexual activity and contraceptive use: national cross-sectional survey. *Contraception* 2006; 74: 224-33.

39. Wiebe E. Contraceptive practices and attitudes among immigrant and non-immigrant women in Canada. *Canadian Family Physician* 2013; 59: e451-5.

40. Pottie K, Greenaway C, Feightner J, et al. Evidence-based clinical guidelines for immigrants and refugees *Canadian Medical Association Journal* 2011; 183(12): E824-925. doi:10.1503/cmaj.090313.

41. Wiebe ER, Sent L, Fong L, et al. Barriers to use of oral contraceptives in ethnic Chinese women presenting for abortion. *Contraception* 2002; 65: 159-63.

42. Crosignani PG, Vecchia CL. Concordant and discordant effects on cardiovascular risks exerted by oestrogen and progestogen in women using oral contraception and hormone replacement therapy. *Human Reproduction Update* 1999; 5(6): 681-7.

43. Reid RL. Oral contraceptives and venous thromboembolism: Pill scares and public health. *Journal of Obstetrics and Gynecology Canada* 2011; 33(11): 1150-5.

44. Mazza D, Harrison C, Taft A, et al. Current contraceptive management in Australian general practice: an analysis of BEACH data. *Medical Journal of Australia* 2012; 197(2): 110-4.

## Appendix

**Table A**
**Level-7 Anatomical Therapeutic Chemical (ATC) classification codes and descriptions used to identify users of oral and non-oral hormonal contraceptive users**

| Oral contraceptive users | | Non-oral contraceptive users | |
|---|---|---|---|
| Level-7 ATC code | ATC description | Level-7 ATC code | ATC description |
| G03AA07<br>G03AB03 | Levonorgestrel and ethinylestradiol | G02BB01 | Intravaginal contraceptives |
| G03AA11<br>G03AB11 | Norgestimate and ethinylestradiol | G03AA13 | Norelgestromin and ethinylestradiol |
| G03AA09<br>G03AB05 | Desogestrel and ethinylestradiol | G03AC06 | Medroxyprogesterone |
| G03AA12 | Drospirenone and estrogen | | |
| G03AA05<br>G03AB04 | Norethindrone and ethinylestradiol | | |
| G03AA01 | Etynodiol and ethinylestradiol | | |
| G03HB01[†] | Cyproterone and estrogens | | |
| G03AC01 | Norethisterone | | |
| G03AA06 | Norgestrel and ethinylestradiol | | |

[†] used for acne therapy and contraception
**Source:** World Health Organization.

**Table B**
**Anatomical Therapeutic Chemical (ATC) codes used to identify cardiovascular-related medications**

| Medication | ATC code | ATC description | Excluding |
|---|---|---|---|
| **Anti-hypertensives** | C02 | Miscellaneous anti-hypertensives | C02KX01 |
| | C03 | Thiazide diurectics | C03BA08<br>C03CA01 |
| | C07 | Beta-blockers | C07AA07<br>C07AA12<br>C07AG02 |
| | C08 | Calcium channel antagonists | |
| | C09 | Agents acting on the Renin-Angiotensin system | |
| **Lipid modifiers (statins)** | C10AA | HMG COA reductase inhibitors | |
| | C10AB | Fibrates | |
| | C10AC | Bile acid sequestrants | |
| | C10AD | Nicotinic acid and derivatives | |
| | C10AX | Other lipid modifying agents | |
| | C10BA | HMG CoA reductase inhibitors in combination with other lipid-modifying agents | |
| | C10BX | HMG CoA reductase inhibitors, other combinations | |
| **Anti-thrombotic agents (anti-coagulants)** | B01AA | Vitamin K antagonists | |
| | B01AB | Heparin group | |
| | B01AE | Direct thrombin inhibitors | |
| | B01AF | Direct factor Xa inhibitors | |
| **Anti-platelets** | B01AC | Platelet aggregation inhibitors excluding heparin | |

**Note:** Selection of medications uses codes based on: Wilkins K, Gee M, Campbell N. The difference in hypertension control between older women and men. *Health Reports* 2012, 23(4). Available at: http://www.statcan.gc.ca/pub/82-003-x/2012004/article/11721-eng.pdf
**Source:** World Health Organization.